Physics 10 Midterm exam 2 Part A – Essay Questions April 15, 2004

Last name_____ First name_____SID_____

Essay questions (20 pts): pick **one** and only one to answer. Write a page or two (or whatever is appropriate) on this sheet. Cover the important points in a clear and concise manner – as if you have only a few minutes to tell the President, your roommate, or your parent, what that person needs to know. Clear, effective writing is important.

1. Some people are surprised by the statement that light does not always travel "at the speed of light." What does that mean? What are the implications of "slow light"? What are the phenomena that result, and what practical applications come from the fact that light sometimes travel slower than the value $c = 3 \times 10^8$ m/sec.

2. Light is a wave. But according to quantum mechanics, it is also "quantized." What does that mean? Describe some practical applications of light that make use of the fact that both it and energy levels are sometimes quantized.

Physics 10 Midterm exam 2 Part B – Short Questions April 15, 2004

Last name_____ First name_____SID_____

Short questions (1 point each, 20 points total). Read the questions carefully so that you don't misinterpret them (e.g. by missing a word such as "not").

1. Remote control of a TV is usually done using
   ( ) UV
   ( ) IR
   ( ) microwaves
   ( ) X-rays

2. The mirage of water on a road comes from
   ( ) light bending downward
   ( ) light bending upward
   ( ) blue light bending more than red
   ( ) red bending more than blue

3. Your eye has
   ( ) one lens, called "the lens"
   ( ) two lenses, the lens and the cornea
   ( ) two lenses – the lens and the retina
   ( ) no lenses, but behaves like a pinhole camera

4. Your eye has cells sensitive to
   ( ) cyan, magenta, and yellow
   ( ) red, green, and blue
   ( ) red, white, and blue
   ( ) cyan, magenta, and blue

5. "Invisible light" includes
   ( ) UV, quarks, and gluons
   ( ) x-rays, UV, and IR
   ( ) blue, ultrablue, and ultrared
   ( ) quanta, antiwhite, and photons

6. holograms depend on the fact that light
   ( ) contains red, green, and blue
   ( ) is quantized
   ( ) is a wave
   ( ) can be focused

7. NMR has changed its name to
   ( ) CAT
   ( ) MRI
   ( ) ultrasound
   ( ) PET

8. For seeing people at night, the military uses:
   ( ) UV
   ( ) x-rays
   ( ) microwaves
   ( ) IR

9. A "black light" emits
   ( ) UV
   ( ) IR
   ( ) x-rays
   ( ) gamma rays

10. The ozone layer absorbs
    ( ) solar UV
    ( ) solar IR
    ( ) solar x-rays
    ( ) ozone

11, Compasses point north because
    ( ) the North Star attracts them
    ( ) the Earth has an electric charge
    ( ) there are electric currents in the iron core of the Earth
    ( ) there are magnetic monopoles near the North Pole

12, The Earth's magnetic flips are used for
    ( ) creating new permanent magnets
    ( ) proving the Earth has a solid iron core
    ( ) generate useful power
    ( ) geologic dating

13. Europe uses higher voltage to:
    ( ) waste less energy
    ( ) make light bulbs brighter
    ( ) reduce the danger of shock
    ( ) eliminate the need for transformers

14. Magnetism comes from
    ( ) magnetic monopoles
    ( ) moving quanta of light
    ( ) quantization of charge
    ( ) moving electric charge

15. A laser operates on the principle of
    ( ) nuclear magnetic resonance
    ( ) fluorescence
    ( ) quantization of charge
    ( ) photon avalanche

16. AC is used instead of DC because
    ( ) it is safer
    ( ) it carries more power
    ( ) it allows use of transformers
    ( ) it is higher voltage

17. A Richter 8 earthquake, compared to Richter 7, has about
    ( ) 14% more energy released
    ( ) 2 to 4 times more energy
    ( ) 10 to 30 times more energy
    ( ) less energy

18. An octave in frequency, is a factor of
    ( ) 2
    ( ) 8
    ( ) 10
    ( ) sqrt(2)

19. “Multispectral” refers to
    ( ) UV, IR, and visible
    ( ) many colors in visible light
    ( ) UV, IR, and x-rays
    ( ) “whiter than white”

20. The highest frequency in this list is for
    ( ) gamma rays
    ( ) UV
    ( ) IR
    ( ) microwaves